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Knowledge of Patients Regarding Infection Control in Dentistry: Development and Validation of a New Questionnaire

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A B S T R A C T

Objectives: Assessment of patients' knowledge regarding infection control in dentistry can help professionals in the development of protocol planning to minimize the risk of disease transmission through dental procedures. The aim of this paper is to assess the knowledge level about infection control of patients presenting to the dental clinic of the School of Dentistry, Tehran University of Medical Sciences in 2020.

Materials and Methods: The draft of the questionnaire was designed with eight domains regarding infection control in dentistry including the coronavirus disease-2019 (COVID-19). The content validity of the questionnaire was assessed by six experts and 10 laypersons. The reliability of the questionnaire was assessed by the test-retest method. Two-hundred and forty-four patients (over 20 years of age) were selected based on non-random convenience sampling method, and participated in this study in July 2020. According to the difficulty coefficient, differential coefficient, and the opinion of the experts about the questionnaire filled out by the participants, 24 questions were selected out of 43 for the final version.

Results: The intra-rater reliability indices were ≥75% and the scale-content validity indices for relevance, simplicity, and clarity were 87.80%, 93.75% % and 93.33%, respectively. The knowledge score of patients was 76.83%±11.58% which was not correlated with the level of education, age or gender (P>0.05).

Conclusion: The knowledge level of patients presenting to the dental clinic of Tehran University of Medical Scineces measured by a valid and reliable researcher-made questionnaire was acceptable about infection control.

Keywords: Awareness; Surveys and Questionnaires; Infection Control; Dentistry

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INTRODUCTION

Patient safety is the most important factor to consider in medical and dental treatment offered, both privately and/or at institutions. Direct or indirect infection transmission or cross-contamination of infections between patients and the staff may occur in dental settings [1-3]. Infections can be transmitted directly through blood, saliva, tissue residues, and respiratory droplets and aerosols generated during dental procedures [1-3]. Infections may also be transmitted indirectly through contact with the instruments, equipment or surfaces contaminated with blood, saliva or salivary droplets or aerosols generated during dental procedures [1-3]. Thus, adherence to the standard precaution guidelines for infection control, verified by Centers for Disease Control and Prevention (CDC), is imperative [2]. Since all infected

patients, especially those infected with coronavirus disease-2019 (COVID-19), cannot be identified by taking a medical history, physical examination, or preclinical tests, preventive measures should be incorporated in the daily routines [4,5].

Infection control by dentists and healthcare workers has been extensively studied, and using personal protective equipment (PPE; medical gloves, face masks, goggles, and medical gowns), in addition to the sterilization of instruments, have been particularly emphasized [1-3]. However, evidence shows that infection control guidelines are not properly followed in some dental clinics and hospitals [6-8]. Dental patients are concerned about their health and transmission of diseases such as hepatitis, AIDS, respiratory diseases, and infections with high-risk of transmission such as COVID-19 that can be transmitted through dental procedures and in these settings [9,10].

There are some national, international, and non-governmental organizations that allow patients to get involved in their healthcare procedures with respect to the quality and safety of services

[11]. Adherence to infection control protocols reportedly has had a better status in recent years, and some advances have been made due to professionalization and enhanced knowledge and expectations of the public [12,13]. Thus, involvement of patients in their healthcare services can increase their responsibility in these settings together with the dental clinicians and office staff [13]. Thus, the first step is to raise awareness and enhance the knowledge of patients in this respect. This can be done by educational strategies and training as well as culture building for dental patients and staff [14]. However, such interventions require adequate information about the current knowledge status of the general population. On the other hand, it has been reported that the level of literacy and social position of individuals affect their knowledge level and attitude towards many social aspects of health [15-17]. Provided that the knowledge level of individuals about infection control in dentistry is determined, their beliefs and attitudes may be corrected and their knowledge level can be enhanced. By doing so, the likelihood of poor adherence to infection control protocols and guidelines can be greatly minimized [14].

Using a questionnaire is the best method to assess the knowledge level of individuals about a particular topic [17,18]. However, a standard, validated, and naturalized questionnaire for the Iranian population to assess their knowledge level about infection control in dentistry is lacking. Thus, this study aimed to design, standardize, and naturalize a questionnaire to assess the knowledge level of dental patients about infection control in dentistry presenting to the dental clinic of School of Dentistry, Tehran University of Medical Sciences in 2020.

MATERIALS AND METHODS

This cross-sectional study was approved by the ethics committee of the School of Dentistry, Tehran University of Medical Sciences (IR.TUMS.DENTISTRY.REC.1398.125). Written informed consent was obtained from all subjects after providing a complete description of the study. To devise a questionnaire, the general principles of infection control according to the standard infection control guidelines [1-3] were divided into smaller topics, and a tree diagram was designed with 8 branches. Accordingly, 56 questions were designed based on relevant articles, similar questionnaires, and accredited textbooks and resources regarding infection control for the first version of the questionnaire [1-3,16-18].

The branches of the tree diagram included the following 8 sections:

(I) PPE with 17 questions (8 questions regarding medical gloves, 4 questions regarding face mask, 3 questions regarding goggles, and 2 questions regarding medical gown)
(II) Hand washing with 3 questions
(III) Sterilization and disinfection of instruments and equipment with 10 questions
(IV) Dental units with 3 questions
(V) Communicable diseases with 15 questions
(VI) Plastic covers and wraps with 2 questions
(VII) Non-operatory surfaces with 4 questions
(VIII) Radiography with 2 questions

To calculate the content validity of the questionnaire, its relevance, simplicity, clarity and consistency were evaluated [19]. Next, a draft of the designed questionnaire along with a form was administered among experts from the Restorative Dentistry, Prosthodontics, Oral and Maxillofacial Surgery, Oral and Maxillofacial Radiology, Pediatric Dentistry, and Periodontics Departments of the School of Dentistry of Tehran University of Medical Sciences, and they were asked to assess it. The form included a table to score each question regarding the content validity items (from 1 to 4, indicating low to high, respectively). The content validity was assessed according to the opinion of the experts based on inter-rater agreement with a less conservative approach [20].

The scale-content validity index (S-CVI) and the item-content validity index (I-CVI) were quantitatively assessed. The acceptable level was considered to be 70% [21] for the overall agreement, and 83% for the S-CVI and I-CVI (considering the presence of 6 experts) [22,23].

Next, 10 literate, non-academic university staff were selected as laypersons for face validity. They were asked to mark unclear questions according to their opinion, and score the content validity items. Final revisions were made according to their opinion, and the tree diagram of the questionnaire was edited accordingly.

The second version of the questionnaire included 43 questions in the same eight domains of infection control in dentistry, and was administered among 244 patients presenting to the dental clinic of School of Dentistry of Tehran University of Medical Sciences in July 2020. The inclusion criteria were: age over 20 years, signing informed consent forms, and literacy to fill out the questionnaire. The patients were selected by non-random convenience sampling and were requested to complete the questionnaire. The difficulty coefficient and the differential coefficient of the questions were also calculated, and some questions that were very difficult or very simple were considered unacceptable and omitted (version 3). The acceptable difficulty coefficient ranged from 0.3 to 0.8, and the acceptable differential coefficient was ≥0.3 [24].

The reliability of the questionnaire was assessed by the test-retest reliability method. For this purpose, the questionnaire was administered again among 30 participants (a subset of the sample of 244) after 2 weeks, and the scores acquired in the two phases were compared. The intra-class correlation coefficient and the percentage of agreement were then calculated.

In addition, level of knowledge of the participants was separately analyzed based on age, gender and educational level.

Scoring:

For scoring of the answers to the questions of the final version, all answer choices were dichotomized into true and false. Each true answer was allocated a score of 1 and each false answer was allocated a score of 0. The sum of scores was then calculated. The total score was standardized and could range from 0 to 100.

Statistical analysis:

Data were analyzed using SPSS version 25 (IBM Corp., Release 2017. IBM SPSS Statistics for Windows, Armonk. NY, USA). The responses of participants to the questions were analyzed in general, and separately based on age groups, level of education, and gender. Assuming the normal distribution of data, the mean and standard deviation of knowledge score were reported. The linear regression was applied to assess the correlation of overall knowledge score with age, gender, and level of education with the level of significance set at 0.05.

RESULTS

The overall degree of agreement of the experts in assessment of the questions of the first version of the questionnaire in the less conservative approach was 82.14% for relevance, 91.07% for simplicity, 91.07% for clarity, and 94.64% for consistency. The S-CVI was 87.80% for relevance, 93.75% for simplicity, 93.33% for clarity, and 92.56% for consistency. The I-CVI of each question was evaluated for relevance, simplicity, clarity and consistency, which was generally acceptable. The questions with unacceptable content validity items were omitted, which included: one question regarding hand washing, 3 questions regarding sterilization and disinfection of instruments, 5 questions regarding communicable diseases, 2 questions regarding non-operatory surfaces, and 1 question regarding the medical gown. The

questions on COVID-19 were merged with the questions under the domain of communicable diseases.

The mean age of 244 participants was 39.34 years (range 20 to 70 years). Of all, 157 (64.3%) were females and 87 (35.7%) were males. The level of education was categorized into below high-school diploma, high-school diploma, and College/University education, with a frequency of 18.4%, 41.0%, and 40.6%, respectively.

The test-retest reliability assessment revealed that the percentage of agreement for all questions was ≥90%, except for one multiple-choice question, which had an 80% agreement percentage. According to the difficulty and differential coefficients, and the percentage of agreement, 24 questions were selected for the final version of the questionnaire (version 3, Figure 1). Of 24 questions, 4 were multiple-choice, and the remaining were binary yes/no questions. The omitted questions from the second version of the questionnaire included: 11 questions regarding personal protective equipment (6 questions regarding medical gloves, 2 questions regarding face mask, 2 questions regarding goggles, and 1 question regarding medical gown), 6 questions regarding communicable diseases, 1 question regarding plastic covers and wraps, and 1 question regarding non-operatory surfaces.

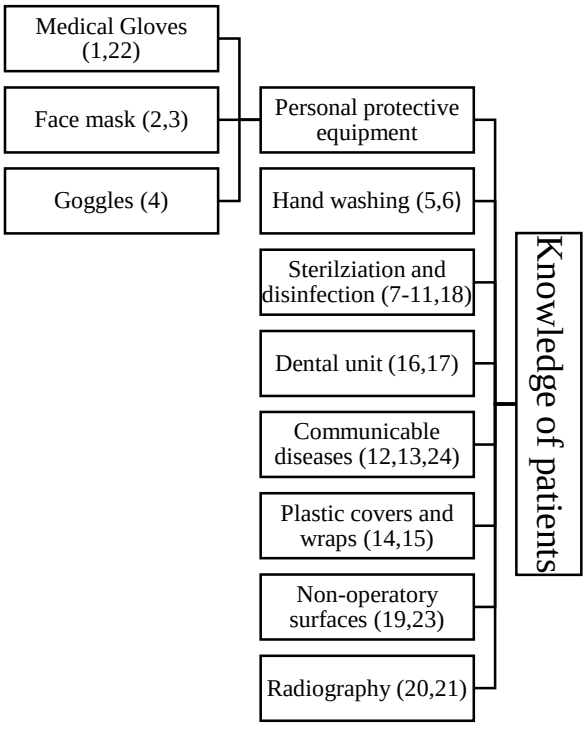

Fig. 1. Tree diagram of the questionnaire

After administering the final questionnaire to the final version of the questionnaire (version 3 or final version), the overall knowledge score of patients was found to be 76.83%±11.58%. The details regarding the knowledge level of patients are presented in Table 1. Of different infection control domains, the knowledge of participants was the lowest regarding dental units (57.58±30.33) and the highest about plastic covers and wraps (90.98±23.58). According to the linear regression, knowledge level had a non-significant direct correlation with level of education (regression coefficient=1.27; 95%CI: -0.71 to 3.25; P=0.21). Knowledge score had no correlation with gender (regression coefficient=0.83; 95%CI: -2.22 to 3.88; P=0.59) or age (regression coefficient= 0.49; 95%CI: -1.06 to 2.03; P=0.54).

DISCUSSION

In the present study, a questionnaire was designed to assess the knowledge level of patients presenting to the dental clinic of the School of Dentistry of Tehran University of Medical Sciences regarding infection control in dentistry. To assess the content validity of the questions, the opinion of experts with different dental specialties and laypersons was asked. The I-CVI and S-CVI were quantitatively assessed, both of which showed higher than acceptable values (83%) [22,23].

In designing a questionnaire, the higher the number of experts assessing its content validity, the higher the likelihood of a low CVI would be, because the number of questions that all experts agree on their suitability would decrease. Using the opinion of three experts is acceptable; however, using 5 to 10 experts is preferred and using more than 10 experts may be unnecessary [22, 23]. In the present study, the CVI was high, which indicates optimal content validity of the

Table 1. Knowledge score of patients presenting to the dental clinic of School of Dentistry of Tehran University of Medical Sciences (N=244) about different domains of infection control

	Total score	Gender		Age group (years)				Level of education		
		Female	Male	20-29	30-39	40-49	≥50	Below high-school	High-school diploma	University
Total score of 24-item questionnaire	76.83±11.58	77.12±11.48	76.29±11.79	73.35±12.54	78.79±11.47	76.79±10.84	76.27±11.61	75.56±9	76.29±12.6	77.95±11.55
Personal Protective equipment (5 questions)	75.41±19.34	11.48±75.41	11.79±75.4	12.54±76.28	11.47±77.95	10.84±74.03	11.61±71.11	9.00±72.89	12.60±76.8	11.55±75.15
Hand washing (2 questions)	81.15±27.84	75.41±18.24	75.40±21.28	76.28±20.12	77.95±19.66	74.03±17.79	71.11±20.53	72.89±20.96	76.80±19.22	75.15±18.76
Sterilization and disinfection of instruments (6 questions)	75.27±21.25	18.24±83.44	21.28±77.01	20.12±76.74	19.66±85.8	17.79±79.22	20.53±79.17	20.96±80	19.22±80.5	18.76±82.32
Dental unit (2 questions)	57.58±30.33	83.44±24.93	77.01±32.17	76.74±29.58	85.80±26.21	79.22±27.33	79.17±30.18	80.00±26.97	80.50±28.33	82.32±27.95
Communicable diseases and COVID-19 (3 questions)	80.60±23.75	24.93±74.63	32.17±76.44	29.58±70.93	26.21±76.70	27.33±75.54	30.18±76.39	26.97±69.26	28.33±76	27.95±77.27
Plastic covers and wraps (2 questions)	90.98±23.58	74.63±22.22	76.44±19.45	70.93±21.55	76.70±21.67	75.54±21.04	76.39±20.46	69.26±21.60	76.00±21.1	77.27±20.95
Non-operatory surfaces (2 questions)	76.23±27.75	22.22±59.24	19.45±54.6	21.55±58.14	21.67±55.68	21.04±59.09	20.46±58.33	21.60±56.67	21.10±57	20.95±58.59
Radiography (2 questions)	80.74±29.01	59.24±30.39	54.60±30.15	58.14±30.73	55.68±30.73	59.09±31.13	58.33±28.03	56.67±31.26	57.00±29.32	58.59±31.17

designed questionnaire despite the fact that 6 experts evaluated its content validity.

One strength of this questionnaire was that part of its questions focused on infection control during the COVID-19 pandemic. During the COVID-19 pandemic, all governments, including the Iranian government, with the help of the World Health Organization, attempted to raise awareness and enhance public knowledge about infection control regarding COVID-19. The high score acquired by the patients in this domain may indicate the relatively good performance of the Iranian government, the World Health Organization, and the Iranian media in this respect [25,26].

To assess the reliability of the designed questionnaire, the test-retest method was applied and the intra-class correlation coefficient and the percentage of agreement were calculated. The difficulty coefficient of the questions was also assessed. Questions with a difficulty coefficient <0.3 were considered difficult while those with a difficulty coefficient of >0.8 were regarded as easy [24]. A relatively high number of questions (28 out of 43 questions) had a difficulty coefficient of >0.8, and were considered easy. Only one question was considered difficult. Thus, the second version of the questionnaire was very easy for the participants. Therefore, the reason for omission of some questions was because of the high knowledge level of patients about them, and not their lack of significance. Thus, in a community with a lower level of knowledge about infection control, these questions may be added again to the questionnaire. In other words, the second version of the questionnaire with 43 questions may be suitable for some communities.

In the present study, the overall knowledge score of the patients was found to be 76.83%, which when compared to other studies [16-18], indicated a relatively good knowledge on infection control of our patients who presented to the dental clinic of the School of Dentistry of Tehran University of Medical Sciences in July 2020.

In the present study, the total knowledge score of the patients was not correlated with their age or gender, which may indicate that the training received regarding infection control has been effective and equal in both males and females [27].

The knowledge level and attitude of patients regarding infection control in dentistry have been previously evaluated. Studies conducted in the Institute of Dental Medicine in Karachi, Pakistan in 2020 [28] and in the Dental Hospital University of Peradeniya in Sri Lanka in 2016 [17] showed that the awareness of patients about measures to prevent infection transmission in dental clinics during dental procedures was more than 60% and 72%, respectively. Also, 80% of Georgian patients attending dental clinics in 2019 were concerned about the risk of becoming infected during dental procedures [29]. These findings are almost similar to the present findings regarding knowledge level of patients. Another study found that only 21.8% of the participants in dental clinics at King Abdulaziz University Hospital had a satisfactory level of knowledge about infection control in dentistry [16]. In agreement with the present study, they found no significant correlation between gender and knowledge about the risk of infection during dental procedures in Abdulaziz University Hospital [16]. In contrast to our study, knowledge of patients with higher educational level was higher in studies by El-Houfey et al, [15] and Ratnayake et al [17].

One limitation of this study was that only patients presenting to this institution were evaluated, and other institutions or private practices were not assessed. Although people from different socioeconomic classes present to the dental clinic of Tehran University of Medical Sciences, most of them probably have a lower socioeconomic level than patients presenting to private offices. This may limit the generalizability of the current findings. Therefore, future multi-center investigations are required to assess the knowledge level of patients presenting to other clinics and private offices regarding infection control.

In general, it may be concluded that the

designed questionnaire can be reliably used as a valid and reliable tool naturalized for the Iranian population to assess their knowledge level about infection control.

CONCLUSION

A standardized questionnaire was designed to assess the knowledge level of patients presenting to the dental clinic of Tehran University of Medical Sciences. The results indicated that the final questionnaire can be used as a valid and reliable tool to assess the knowledge level of dental patients about infection control. The study population demonstrated a reasonable knowledge of infection control in dentistry.

CONFLICT OF INTEREST STATEMENT

None declared.

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